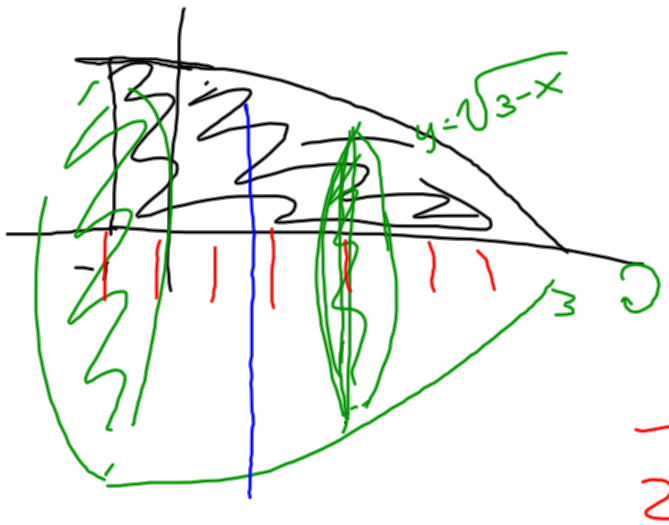
1)



1) integrate along axis of rotation

rotate around x-axis

$\Rightarrow \int \; dx$

2) find limits

$\int_{-1}^{3} \; dx$

3) find area of a cross section | axis of rotation

$A_o = \pi r^2$

4) what is r?

$r = y = f(x) = \sqrt{3-x}$

$\text{Volume} = \int_{-1}^{3} \pi(3-x)\,dx = \star$

3+4 $\Rightarrow$

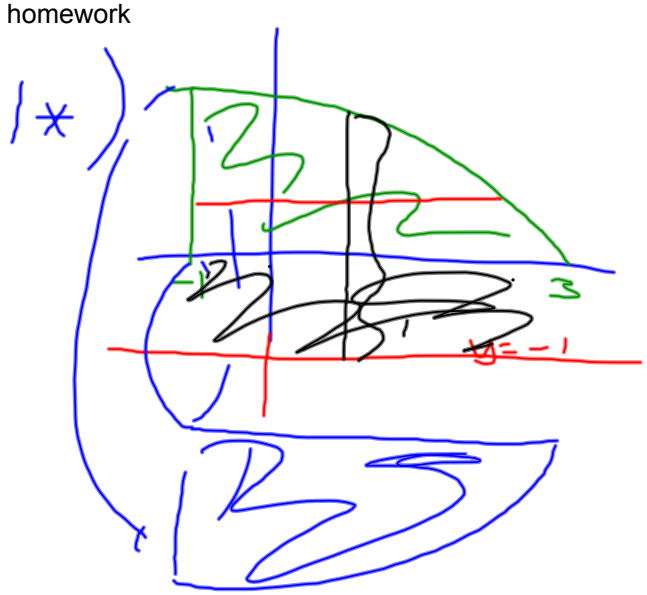
$A = \pi r^2 = \pi\left(\sqrt{3-x}\right)^2$

$= \pi(3-x)$

$\star = \left(3\pi x - \pi\frac{x^2}{2}\right)\Big|_{-1}^{3}$

$= \pi\left(3x - \frac{x^2}{2}\right)\Big|_{-1}^{3} = \pi\left(\left(9-\frac{9}{2}\right)-\left(-3-\frac{1}{2}\right)\right) = \pi(8)$

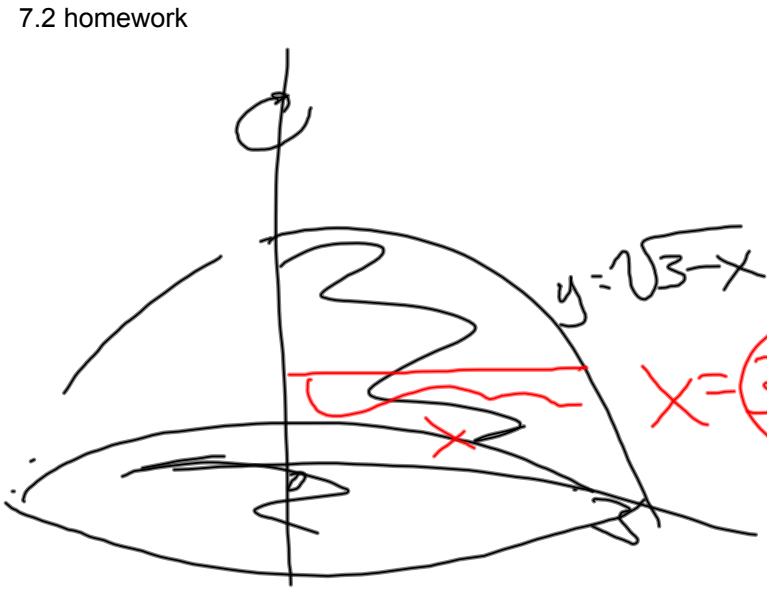
≈ 25.132741229



$$\int_{-1}^{3} \pi (y+1)^2 \, dx$$

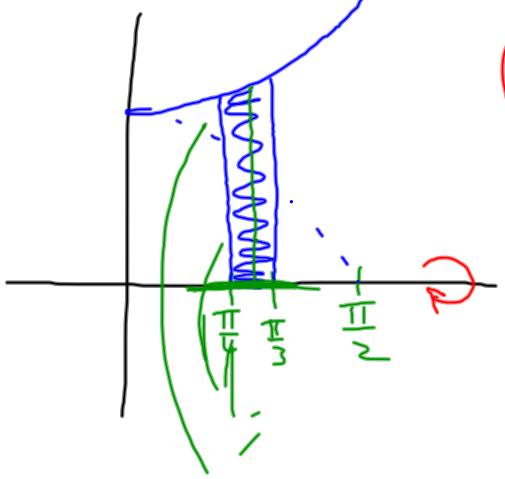
$$= \int_{-1}^{3} \pi \left(\sqrt{3-x}+1\right)^2 dx$$

$$- \int_{-1}^{3} \pi (1)^2 \, dx$$



$$\int_0^{\sqrt{3}} x \, dy$$

6) $y = \sec x$; $x = \frac{\pi}{4}$, $x = \frac{\pi}{3}$, $y = 0$



1) integrate wrt axis of "rotation"

$V = \int \quad dx$

2) find limits

$V = \int_{\frac{\pi}{4}}^{\frac{\pi}{3}} \pi \sec^2 x \, dx$

3) identify area of cross section ⊥ axis of rotation

$A_0 = \pi r^2$

4) what is r?

$r = y = \sec x$

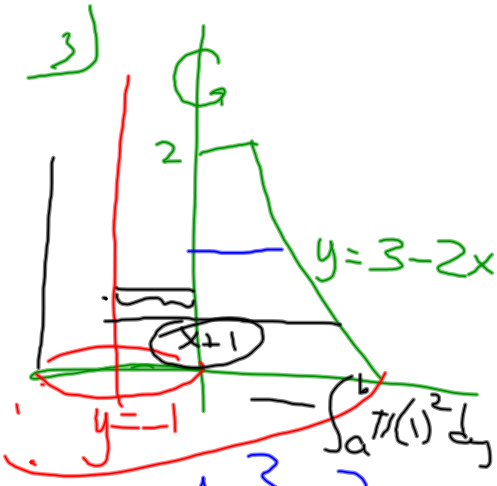
$\pi r^2 = \pi y^2 = \pi (\sec x)^2$

$V = \pi \int_{\frac{\pi}{4}}^{\frac{\pi}{3}} \sec^2 x \, dx = \pi \left(\tan x \right)_{\frac{\pi}{4}}^{\frac{\pi}{3}}$

$= \pi \left(\tan \frac{\pi}{3} - \tan \frac{\pi}{4} \right)$

$= \pi \left(\sqrt{3} - 1 \right)$

3)



$y = 3 - 2x$

$\frac{y-3}{-2} = x$

(1) $V = \int \quad dy$

(2) $\pi \int_0^2 \left(\frac{3-y}{2}\right)^2 dy$

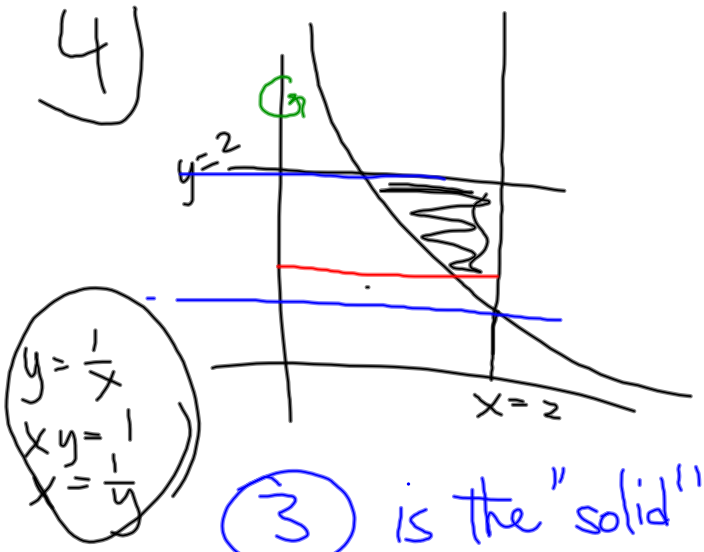
3) $A = \pi r^2$

4) what is r?

$r = x = \left(\frac{3-y}{2}\right)$

$A = \pi\left(\frac{3-y}{2}\right)^2$

4)



1) $\int dx$ or $\int dy$?

2) find limits

$$\int_{\frac{1}{2}}^{2} \bigcirc \, dy$$

3) is the "solid" solid, or does it have a hole?

solid — 1 fn

hole — 2 fns

4) find area of cross-sections

outside radius: $x = 2$

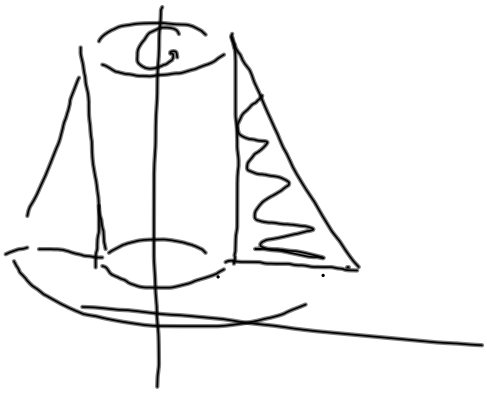
inside radius: $x = \frac{1}{y}$

5) $V = \int_{\frac{1}{2}}^{2} \pi(2)^2 - \pi\left(\frac{1}{y}\right)^2 dy$ (outside, inside)

$= \pi\left(\int_{\frac{1}{2}}^{2} 4 - \frac{1}{y^2}\, dy\right) =$

solid of revolution

cross section is a circle



1) $\int dx$ or $\int dy$

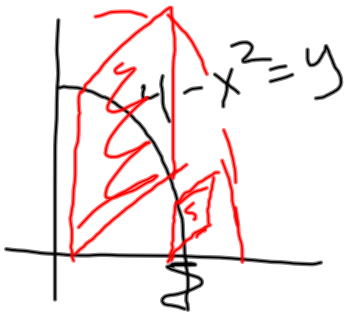
pick the axis of rotation

2) Find the limits w.r.t. d□

3) Is the "solid" solid or hollow?

solid → 1 fn

hollow → 2 fns, big outside volume − volume of hole



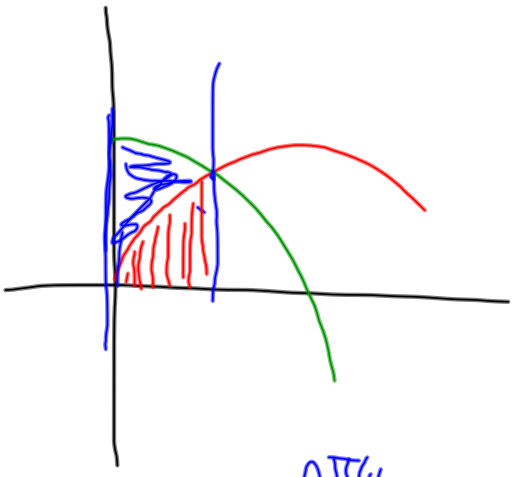
Cross section ⊥ to x axis is a square

4) Find area

5) $V = \int_a^b \pi(\text{outside})^2 - \pi(\text{inside})^2 \, d$?

12) $y=\sin x$, $y=\cos x$, $x=0$, $x=\frac{\pi}{4}$

about x-axis



1) $\int dx$

2) $\int_0^{\pi/4} dx$

3) hole: 2 fn.

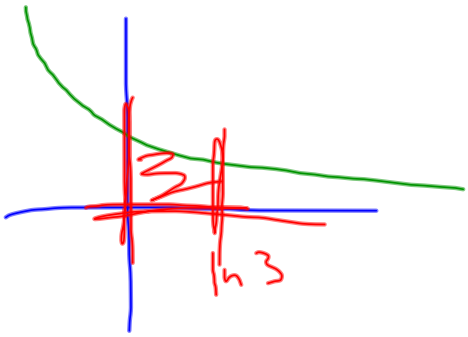
4) $V=\int_0^{\pi/4}(\pi\cos^2 x)-(\pi\sin^2 x)\,dx$

$u=2x$, $du=2dx$, $\frac{1}{2}du=dx$

$=\pi\int_0^{\pi/4}\cos 2x\,dx$

$=\frac{\pi}{2}(\sin 2x)\Big|_0^{\pi/4}=\frac{\pi}{2}(1-0)=\frac{\pi}{2}$

13) $y = e^x$, $y = 0$, $x = 0$, $x = \ln 3$. about x-axis



$$V = \int_0^{\ln 3} \pi (e^x)^2 \, dx$$

$$= \pi \int_0^{\ln 3} e^{2x} \, dx$$

$u = 2x$

$\frac{1}{2} du = dx$

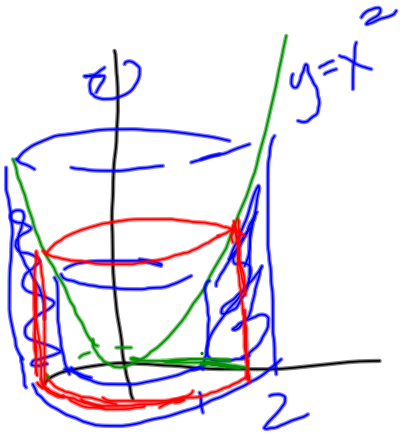
$$= \frac{\pi}{2} \int_0^{\ln 3} e^u \, du = \frac{\pi}{2} e^{2x} \Big|_0^{\ln 3}$$

$$= \frac{\pi}{2} \left(e^{\ln 3^2} - e^0 \right)$$

$$= \frac{\pi}{2} (9 - 1) = 4\pi$$

3

#1)



surf area = $(2\pi r)(h)$

$r = x$

$h = f(x)$

$$\int_1^2 2\pi(x)(x^2)\,dx$$